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ID/WG.62/39
12 October 1970
ORIGINAL: ENGLISH

United Nations Industrial Development Organization

Symposium on Maintenance and Repair in Developing Countries

Duisburg, Federal Republic of Germany, 10-17 November 1970

ORGANIZATION AND IMPORTANCE OF COMPANY STANDARDS

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Organized in co-operation with the German Foundation for Developing Countries and the Association of German Machinery Manufacturers (VDMA).

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id.70-5665

In view of the standards established by the International Organization for Standardization (ISO), the national standards institution and the standards organizations of industrialized countries, the management of an industrial enterprise is faced with the question as to the need to standardise within the enterprise. Before decision is made to set up a standards department, the aspects of benefit and expenditure must be examined. The purpose of my remark is to provide management with suggestions concerning the bases of decisions and the establishment of company standards.

It is indisputable that standardization is one of the most important factors promoting industrialization. The earlier standardization is planned, propagated and applied, the greater its rationalization effect. Here the developing countries have a great advantage drawing on the experiences made in industrialized countries, they can ensure that the introduction of standardization goes hand in hand with the development of the national economy. If standardization is introduced at a later stage, i.e. when inefficiency becomes obvious due to haphazardly applied foreign standards or a lack of standards altogether, it will be less successful and far more costly.

Company standardization should be introduced simultaneously with standardization at national level.

It is pre-requisite to the infra-structure development of a national economy that parallel to the building up of industry, the transport system, energy economy, agriculture, public health system, and research and cultural facilities athorizontal level, the vertical structure, including individual industries and associations of industry be established.

Although national standards provide the pre-requisites for company standards, their application can be ensured only by efficiently operating standards departments in the various companies. It is important to correctly recognize and assess the interaction of national and company standards. The standards departments in the industries of the developing countries have

to be organized under far more complex conditions than those which prevail in the industrialized countries. On the one hand industry itself is still in a stage of development, on the other hand the number of available engineering staff is completely inadequate. It is of great importance that the government support the preparation of national as well as company standards, since they create the pre-requisites for training the necessary standards experts.

As the companies themselves are responsible for the drafting of company standards, their view of standardization is company-oriented, standardization activities at national level being only of second concern.

This paper will, therefore, deal primarily with company standards.

Why Do We Need Company Standards?

In view of the great number of international and national standards and recommendations in existence, the following facts must be taken into account in seeking an answer to this question. Established national standards apply to all commonly used sizes and varieties of the items in question. These standards may be compared to a dictionary which contains all words of a language. Just as a writer cannot use all existing words, so no industrial enterprise will be in a position to use the entire range of sizes and varieties covered by a national standard.

The majority of national standards have been developed from already existing trade standards or from company standards. While they have been improved and adjusted with a view to general applicability, they are based and this is an essential pre-requisite on the experiences gained in the companies.

Company standards are selected from available sources and adapted to the specific requirements of the individual companies. They frequently include many items which can never be taken over in national or international standards. On the other hand, they will need and include only a limited part of the national standards.

The essential difference between national standards and company standards, i.e. between theory and practice, has been described by an American standards engineer as follows:

"Theory takes all known possibilities into consideration; practice takes only all existing possibilities into consideration."

ISO and IEC recommendations are not often applied in their original form when introducing company standards.

Company standards are necessary in order to meet the demand for standardized information which, in turn, is needed for tasks of design and development. This information includes not only the data necessary for communication between design department and workshop or between supplier and consumer, but also data concerning the market supply of components and raw materials and production possibilities in the plant. Standardized information is available in the form of standard material, catalogues, standard sheets, specifications, drafting room handbooks, etc. This concentration of information is a valuable time-saving aid for the designer. By consulting catalogue lists of repetition parts, he can sometimes avoid having to design such parts.

Standardization makes it possible to save time when seeking information and to avoid duplication of work. Another advantage of company standards is the reduced diversification of parts and materials. This, of course, saves the firms considerable sums of money, particularly storage costs.

It is quite normal that in the course of time stocks on hand increase and larger numbers of varieties are manufactured. They are often an indicator of an upward trend in business and the continuous improvement of the products. It goes without saying that new parts and materials are constantly being produced.

Since the improvement of existing parts and the design of new parts goes hand in hand with the dropping of older parts which are no longer needed, it becomes evident that the reduction of varieties must be planned systematically. One of the main aims of company standardization is, therefore, to reduce the number of varieties.

As already mentioned, another important objective of standardization is to avoid duplication of work, for example, with regard to the design of simple components or to administrative work in the offices. If we take a look at the offices, we often find that Mr. Baker, who is working in the warehouse, is doing the same thing Mr. Smith is doing in the purchasing office; they are both entering ordered stocks on index cards. Neither knows what the other is doing; perhaps they don't even know each other. This may not be a catastrophe, but it is certainly a waste of time and money. There are many Bakers and Smiths in our offices. Duplication of work can be avoided if forms, work-flow charts and job descriptions are standardized. It is a matter of organization whether this task is taken over by the standards engineer or by an associated office.

Another important task of the standards engineer is the introduction of foreign standards and specifications and their adaption to conditions in the company. Frequently these documents are provided by the purchasers of a product. They differ considerably with regard to make-up and arrangement, and are often written in a foreign language. These documents cannot be handed out to the offices in their original form. One of the tasks of the standards department is to revise these documents and comment or abridge them where necessary, so that the various departments can apply them correctly and economically.

If we compare the books of standards of various companies, we find that the majority of standards compiled are company standards. Secondly, trade standards are included, a large number of which have had to be adapted for company use. Apart from a few exceptions, usually basic standards and metrological standards, the national standards have been taken over in revised form. International recommendations - if included at all - have also been revised extensively. As a rule over 75 per cent of the standards in these books are company standards.

The advantages of company standards can be summarized as follows:

-reduction of the number of purchase orders
-reduction of stocks

-simplification of design recommendations
-improved enforcement of safety regulations
-rationalization of warehouse administration
-reduction of costs involved in testing.

The Role of Standardization.

In order to be able to assess the significance of company standards, we must consider the spheres where standardization can be introduced. Since there are different types of production on which company standards have to be based, we must first study these differences. In view of their influence on company standardization the following two types of production should be mentioned:

1. Products consisting of components from several manufacturing stages:
   a) Series production (catalogue-type business), i.e. the production of tractors - standard types with a number of varieties which can be ordered through a catalogue;
   b) Single production (requisition-type business), i.e. the production of power plant machinery and equipment which differ with each order - size and design are largely determined by the buyer.
2. Single-stage production, as i.e. the production of detergents or cement.

With regard to company standardization a distinction must be made between industrial enterprises manufacturing products consisting of components from supplier firms, apparatuses manufactured externally, and components designed and manufactured in the company itself, and enterprises where products are manufactured in a single stage and where only the raw material must be purchased but where extensive and often complex plants are required. The type of production (single production or series production) will considerably determine the effect company standards will have.

Whereas specifications for the procurement of materials and correlation of the component parts of the products in connection with the maintenance are of predominant importance in mass production, the reduction of variety, the use of repetition parts and the selection of the most suitable materials are the factors of main emphasis in individual construction. In single stage production emphasis is laid on the standardization of manufacturing supplies, spare parts for production equipment, operation materials, tools and appliances. The sphere of influence differs accordingly. When company standards are adopted in multi-stage production, they have a considerable effect on design and development; in single stage production, however, there will be a negligible effect, if any, on the efficiency of the design and development departments.

The main spheres in which company standards contributes to nationalization are:

-product planning
-development and design
-graphic reproduction and documentation
-construction of tools and manufacturing supplies
-production planning and control
-procurement of materials
-goods entry control
-storage
-materials testing
-quality control.

One area in which standardization is very desirable is electronic data processing. Standardization greatly facilitates the processing of information. Due attention should be paid to this fact in the initial stages of company standardization. If computers are not used, it must be borne in mind that the information selected for processing must meet computer requirements. If this is not done in the initial stage, it is inevitable that when electronic data processing is introduced at a later date the costs will be much higher, due to the necessary adjustment of the data to be processed. Electronic data processing is being introduced in all sectors of industry today, and account must be taken of this fact when introducing company standards.

In series production company standardization will as a rule facilitate the work of the departments responsible for the abovementioned tasks. In single production the areas of application are the same; there will only be shifts of emphasis in the various functional spheres. For example, economization possibilities will be of more importance in single production than in series production, where, due to the large amounts ordered, economization by reducing the number of varieties is not very promising. In the automobile industry which is a good example for modern mass production, we speak of a standardization threshold beyond which no savings can be achieved by reducing the number of models and increasing piece numbers. In other words, it does not make any difference whether a standardized or non-standardized part is used. Apart from the favourable cost factor, there is also the advantage, among others, of improved maintenance possibilities when standardized parts are used.

In single-stage production the influence of company standards covers the following fields:

-construction of plant facilities
-production control (in some cases)
-maintenance
-procurement of materials
-goods entry control
-storage of spare parts for production facilities.

These are mainly departments which concern themselves with planning, administration and maintenance of production facilities.

To What Extent Can Costs Be Influenced By Company Standardization?

It is well known that the more evident the possibility of economizing through planned action, the easier the decision to carry it through. Standardization clearly has the advantage of saving costs. As the effect of standardization makes itself felt in such a large number of fields, it is impossible to assess its overall effect. Every attempt to justify a company standardization programme on the basis of cost accounting gives rise to problems, the majority of which have remained unsolved.

With a few exceptions, the literature on standardization contains information on individual measures only. Especially in European literature no information on the actual amounts saved is provided. In principle it is not difficult to assess these amounts. However, actual figures in terms of money indicating the overall success of standardization would reveal too much about the enterprise and are, therefore, not published. For this reason the discipline concerned with these problems in Germany lacks the basic data which is essential in ascertaining the economic benefit derived from standardization.

The following should, therefore, be understood simply as an attempt to show the possibilities of a standardization programme. Figures indicated are not generally valid. In practice the pre-requisites for standardization differ to such an extent that at present generally applicable values cannot be indicated.

Having ascertained in which spheres standardization can be applied, we must determine the costs arising in these spheres and their share in the total turnover.

The turnover of an enterprise consists of:

-direct material costs	30 per cent
-direct wage costs	10 per cent
-indirect or fixed costs	50 per cent
-taxes, etc.	10 per cent

Material costs may be affected by standardization to a considerable extent. Labour costs are only indirectly affected. The effect of standardization on labour costs will be investigated in another context. Costs such as taxes, etc., are only indirectly affected by standardization. Due to a reduction in goods on hand for example, taxes may be reduced.

The most important factor in this analysis are the fixed costs; they usually account for the largest share of the company's turnover.

They comprise

-sales
-engineering
-production
-finance
-staff and legal matters.

The effects of standardization are felt in the spheres of engineering and production and to a lesser extent also in other spheres.

The next step will be to ascertain the costs of the various spheres in the total turnover. According to studies carried through in the United States, standardization affects 40 per cent of the fixed costs, 70 per cent of the material costs and 55 per cent of the total turnover. Since there is a higher degree of automation in American industry these amounts should be higher in Europe and most certainly so in the developing countries.

Even if these figures do not reveal the results obtainable through standardization, they clearly emphasize the significance of company standards. A forecast of the extent to which costs may be reduced in spheres influenced by standardization is difficult and dependent on many factors, and the decisive importance of these numerous factors is easily overlooked.

The results of the American study show that the savings resulting from standardization fluctuate between 0.3 and 5 per cent, the average being nearly 1 per cent. It become clear that the costs saved in the larger spheres where standardization is carried through cannot be ascertained.

I would now like to show you how the effect of standardization on a company's cost structure can be represented and assessed.

In a table subdivided according to the elements of costs the spheres where standardization has been carried through are listed in the first column. Costs such as sales, finance and staff which are not affected by standardization are not included. The second column lists those departments which are either directly or indirectly affected by standardization. The third column contains the annual costs (in the relevant currency) incurred in these departments. The last column indicates the share of these departments in the total annual turnover in per cent.

The next step, that of assessing the savings possibilities arising from the introduction of company standards, requires a good knowledge of the structure of the company and much objectivity and insight into the possibilities of standardization.

The probable success is calculated on the basis of the following elements:

-the minimum success which must be achieved

-the presumable success

-the maximum success which can be achieved.

The success achieved by an average standards department under unfavourable conditions and without incurring high expenditures is taken as minimum success.

The assessment of the presumable success is much more difficult. First, the technical standard of the individual fields of application is ascertained. Then the willingness of staff to accept changes and improvements in their methods is studied. In this context psychological aspects are of great importance. Another important factor is the efficiency of the standards department, especially its capacity to carry through a measure.

The following examples may illustrate this situation. A time study revealed that a designer uses up 6.3 hours a week seeking information on tools, semi-finished products, attachments, seals, design details, construction elements, etc., which is essential for his work. Only 60 per cent of his efforts are successful. By standardizing and classifying information, this time loss can be eliminated. If the annual costs for a designer amount to $25,000, including the costs for his place of work, an amount of $160,000 (6.4 per cent of the total costs) can be saved in an office where 100 designers are employed.

The costs of the drawing office can be reduced by 10 per cent by rationalizing the preparation of drawings. At the same time the paper should be fully utilized. The costs involved in reproduction can then be reduced considerably.

A reduction of stocks goes hand in hand with a reduction in storage costs and also in the number of items to be handled. The store department will handle less orders, but due to the increased turnover, there will be larger piece numbers, which means a reduction of unit costs. Thanks to the smaller number of purchase orders, the work of the goods entry control department is reduced. The costs for a purchase order lie between $5 and $100, the administrative costs for a stored item between $160 and $300. Consequently the varieties stored are reduced, possible savings in other areas of the materials sector can be assessed.

A maximum success is defined as the results which can be achieved in a field of application under most favourable conditions. The probable success is calculated by means of the equation

$$E = \frac{a + 4m + b}{6}$$

which is used for other types of statistics.

E = expected probable success

a = minimum success

m = estimated presumable success

b = maximum success

Taking as basis the percentage of the calculated probable success, the amount of the probable savings can be calculated on the basis of the annual costs. Total expected savings are obtained by adding together the individual values. In addition, the share in the annual turnover can now also be ascertained.

Attention must be paid to the following points:

1. The success calculated in this manner cannot be achieved within a short period of time. During the first years after the introduction of standardization, the progress made will be negligible.

2. Once the calculated success has been achieved, it is either not repeatable or only at large time intervals and to a much lesser extent. Permanent efforts are, therefore, necessary to maintain the level achieved.

3. Changes in the spheres of application can overshadow the effects of standardization. These changes may take the form of a change of the number of orders, high investments in the fields of application, reduction or increase of staff, programme changes, etc. Such changes are common to all dynamic enterprises.

When considering the question of costs, it should be emphasized that the decision to introduce company standardization does not depend exclusively on savings anticipated. There are numerous cases where the introduction of company standards is necessary and where a standards department is set up even if savings cannot immediately be reckoned with. This is due to external influence or internal measures. For example, the introduction of electronic data processing requires the establishment of a standards department. An inquiry carried through in several hundreds of industrial establishments revealed that as a rule one dollar invested in standardization will result in savings up to $50. On an average the savings amount to $5 for each dollar invested in standardization.

Organization of Company Standardization Activities.

When organizing a modern standards department, it is necessary to take into consideration those principles which render possible effective and economical work. These are:

-the scientific principle in standardization work
-the cybernetic principle of organizing standardization
-the principle of progressiveness of the development of standardization
-the principle of coordination of the effects.

The scientific principle underlying the work of standardization serves to guarantee good results by organizing the flow of work systematically, methodically and logically.

The various stages involved in this task are as follows:

1. Definition of the requirements or the problem.
2. Collection of information and data.
3. Analysis and organization of data.
4. Ascertainment of the chief tasks or the statistical accumulation points.
5. Ascertainment of the maximum limits of manufacturing or operational costs.
6. Ascertainment of the technical standard of the company itself, ascertainment of competitors, and clarification of legal questions.
7. Preparation of the standard involved and relevant documents.

8. Informing and instructing the departments concerned.
9. Observation of the effect of standardization in order to be able to suggest improvements or changes.
10. Improvement of the standard involved.

The structure of a standards department - regardless of its tasks and size - should take into account the cybernetic principle of the control cycle. This means that the application and recognition of standards must be added to the category of systematizing, controlling and informing, if standardization is to be more than just theory. Feedback through application gives new impetus to standardization, shows where improvements are necessary and where gaps exist, and indicates the degree to which implemented measures have proved expedient. Feedback occurs when material is requested for externally manufactured parts, semi-finished products and drawings for company-constructed parts. Feedback through standardization results from the arrangement of drawings and lists of parts. Another point of feedback contact is storage administration and quality control.

On the basis of the principle of progressiveness, the harmonious interaction of the individual standards is ensured. A standard which is widely applied in an industrial enterprise serves to ensure that the functions of the departments concerned are harmonized. This effect of a standard has to be taken into consideration when it is being developed.

The abovementioned principles must be taken into account when standardization becomes an integral part of management policy. In this context questions relating to the size of a department and the establishment of sub-departments should be discussed.

The optimal size of a standards department depends on the type of production, the size of the company and the frequency with which varieties are changed. The standards department of an enterprise with single-stage or continuous production will require fewer staff than that of an enterprise of the same size which is engaged in multi-stage production. Frequent changes of programmes or models require numerous new designs, materials, new semi-finished products, new tools, etc. This means an increased workload for the standards department and a corresponding increase in staff. The same

arises when we compare a company engaged in single production with one involved in series production. Less work will fall to a standards department in a series-production enterprise than in a single-production one where many adjustments in design are required. The standards department should consist of a standards engineer, a standards tester and a technical assistant. Its structure is determined by the type of tasks, the size of the company, and the workload. No generally valid suggestion can be made as the departments will differ from firm to firm. Too large a standards department will be disadvantangeous, as inter-departmental administrative work would then take up too much time, especially at the leading personnel level.

The standards department should be subordinate to a manager who also supervises the engineering and production departments, the two main spheres influenced by standardization. The standards department would lose its neutrality if it were integrated into one of these spheres, and the result would be a considerable drop in efficiency. This also holds true for companies with continuous single production.

In practice the standards department often have sub-departments responsible for:

-design administration
-graphic reproduction
-microfilms
-technical documentation.

The expediency of this arrangement has, however, been contested. It is recommendable only if the designated activities are directly related to the work of the standards department, if a feedback effect is ensured, or if other advantages can be derived. The standards department should not be entrusted with tasks not directly related with its work; otherwise Parkinson's law would become manifest.

The standards engineering entrusted with organizing a standards department will start his work by compiling data. By means of an analysis of the stock of drawings, he will determine the need for basic standards. The necessary data on tools and semi-finished products is derived from an analysis of lists of parts and of manufacturing plans compiled for the clearance of

stocks can be obtained by analyzing the frequency with which items are moved from the stock. The use of the ABC analysis helps to determine which parts benefit most from being standardized. Other important sectors can be ascertained as a result of co-operation between development and construction. There are many signs indicating the fields where standardization is necessary. Duplication of work is one such signal. The standards engineer must focus his attention on objects, processes, and problems which repeatedly occur (for example, different people doing the same job in different places). Disturbances and difficulties also indicate the need for standardization. The standards engineer then has sufficient basic information at hand and can formulate a concept of standardization and prepare a work programme. The standards engineer should consider it imperative to co-ordinate his work with other departments.

It is very important that management support the company standardization programme. Only then can a long-term effect of standardization be ensured.

Functional Area of Standards	Influence	Annual Costs 1000 $	Percent. of Total Costs %	Estimation of Savings min. % a	probable % m	max. % b	Calculated Percentage E	Savings to be expected 1000 $	Percent. of Total Costs %
Marketing	-	3550	8	-	-	-	-	-	-
Finance, Accounting, Banking	-	1900	4	-	-	-	-	-	-
Employee Relations and Legal	-	1050	2	-	-	-	-	-	-
Engineering	0	8670	20	-	-	-	-	236	0,5
Advance Engineering and Research		1300							
Product Planning and Development	0	1200		1	2	4	1,5	18	
Development and Design	0	3300		2	6	10	4	132	
Drafting and Graph. Reproduction	0	2000		3	7	10	4,5	90	
Testing	-	800		-	-	-	-	-	
Patents and Complaint Expense	-	70							
Manufacturing	0	4320	10					256	5,9
Process and Equipment Development	0	400		1	2	7	2	8	
Tools and Fixture Design	0	520		6	10	30	9,3	46	
Operation Planning and Scheduling	0	800		1	3	8	2,5	2	
Materials Disposition	0	700		5	14	25	9,7	68	
Purchasing	0	400		5	15	23	9,7	39	
Receiving and Incoming Inspection	0	120		1	3	8	2,5	3	
Stockkeeping	0	480		5	10	20	7,5	36	
Quality Control/Production Cont.	0	400		1	2	4	1,5	6	
Maintenance	0	500		5	15	20	9,2	46	
Direct Labor	0	6000	14	1	3	5	2	120	0,3
Direct Material	0	18000	41	5	10	20	7,5	1350	3,1

Total annual costs $ 43000

costreduction - 1962

Net costs 1000$ 41038

Expected costreduction 1962

$$E = \frac{a + 4m + b}{6}$$